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CHROMOSOME NUMBERS OF NEW *ULMUS* (ELM) TAXA INTRODUCED FROM CHINA

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ABSTRACT. Diploid chromosome counts ($2x = 2n = 28$) are reported for the first time in 12 elm taxa newly introduced into the United States from China. These are *Ulmus bergmanniana, U. bergmanniana* var. *lasiophylla, U. castaneifolia, U. changii, U. chenmoui, U. elongata, U. gaussenii, U. glaucescens, U. lamellosa, U. lanceaefolia, U. szechuanica,* and *U. taihangshanensis.*

Key Words: cytology, cytotaxonomy

The most recent account of chromosome numbers in *Ulmus* (Santamour 1993) showed that 24 taxa were diploid ($2x = 2n = 28$) and that only *U. americana* L. (American elm) was a tetraploid ($4x = 2n = 56$). The tetraploid nature of *U. americana* may be a barrier to interspecific hybridization with diploid species but Santamour (1970) reported on a natural triploid hybrid between *U. americana* and *U. pumila* L. A natural triploid involving and resembling *U. americana* was given the cultivar name 'Jefferson' by Sherald et al. (1994) and another similar natural triploid (called "Washington") was reported by Santamour and Bentz (1995). Although Santamour (1972) was unsuccessful in crossing the diploid, fall-flowering Chinese elm (*U. parvifolia* Jacq.) with *U. americana,* Smalley et al. (1993) reported the creation of numerous hybrids between these two taxa, but no chromosome counts on these progenies have been made. Thus, while it may not be impossible to utilize diploid taxa in hybridization programs with the tetraploid American elm, some difficulties may be encountered and these may be related to chromosome numbers.

In recent years, a number of "new" elm taxa have been introduced into the United States from China, and the junior author has been most active in this introduction program. Fu (1980)

listed 24 species and four varieties of *Ulmus* growing in China, of which 24 taxa were native to that country. Of these taxa, diploid chromosome counts have been reported for *U. davidiana* Planch., *U. glaucescens* var. *lasiocarpa* Rehd., *U. laciniata* (Trautv.) Mayr, *U. macrocarpa* Hance, *U. parvifolia* and *U. pumila.* Fu (1980) did not recognize *U. japonica* (Rehd.) Sarg. or *U. wilsoniana* Schneid., but placed both in the synonymy of *U. davidiana* var. *japonica* (Rehd.) Nakai, along with *U. propinqua* Koidz. Thus, it is likely that any taxon in the *U. davidiana* complex would be diploid. Still, there remained a rather large number of Chinese taxa that were virtually unknown in the United States.

Some of these taxa may have traits that could be important in breeding programs and *Ulmus szechuanica* has already been shown to be highly resistant to feeding by the elm leaf beetle (Miller and Ware 1994). Resistance of several other taxa to insects and diseases is suspected but many accessions have not been widely tested because they are still relatively young. Likewise, most introductions have not yet reached sexual maturity and thus have not been available for experiments in interspecific hybridization.

Preliminary to such experimentation, it would be desirable to know the chromosome numbers of these taxa. If any of these new Chinese introductions proved to be tetraploid, they might be more crossable with American elm. Therefore, we have made chromosome counts on all of these taxa, none of which, to our knowledge, have been reported previously.

All of the taxa except *Ulmus taihangshanensis* are listed in Fu (1980). In his 1980 paper, Fu recognized ca. 40 species of *Ulmus* and outlined a new infrageneric classification for the genus. The subgeneric category was indicated only for eight of the species, however. For instance, The Chinese *U. elongata* was placed in series *Mexicanae* L. G. Fu with two North American species, but Fu failed to identify those additional species. *Ulmus lanceaefolia,* the only other species treated here, was considered the sole taxon in series *Lanceaefoliae* Schneid. Such classification may have little bearing on sexual compatibilities however, since numerous hybrids have been made between diploid species classified in different sections and series (Santamour 1972).

MATERIALS AND METHODS

All seed collections were accessioned and germinated at the Morton Arboretum. Potted seedlings were grown at the U.S. National Arboretum and chromosome numbers determined at mitotic metaphase in root tips prepared according to the protocols of Snow (1955). At least three unambiguous counts were made on each of two seedlings of each taxon. Herbarium specimens showing vegetative, flowering, and fruiting characteristics will be made as the trees mature at the Morton Arboretum and will be deposited at NA and MOR.

RESULTS

Diploid ($2x = 2n = 28$) chromosome counts were made for each of the following taxa, listed in alphabetical order, with available information on origin. All of the accession numbers are those used at the Morton Arboretum: *Ulmus bergmanniana* Schneid. (R 94-59) Yunnan Province; *U. bergmanniana* var. *lasiophylla* Schneid. (R 94-22) no source data; *U. castaneifolia* Hemsl. (R 94-11) no source data; *U. changii* Cheng (R 94-23) no source data; *U. chenmoui* Cheng (R 93-117) Anhui Province; *U. elongata* L. G. Fu & C. S. Ding (R 94-6) Zhejiang Province; *U. gaussenii* Cheng (R 94-8) Anhui Province; *U. glaucescens* Franch. (R 93-123) Shanxi Province; *U. lamellosa* C. Wang & S. L. Chang ex L. G. Fu (R 93-128) Hebei Province; *U. lanceaefolia* Roxb. ex Wall. (R 95-22) Yunnan Province; *U. szechuanica* Fang (R 94-2) no source data; *U. taihangshanensis* S. Y. Wang (R 95-21) Hainan Province.

DISCUSSION

These 12 new diploid chromosome counts indicate that the tetraploid American elm may be truly unique in the genus *Ulmus*. As far as we know, there are probably only five or six Chinese taxa that have not been studied cytologically. Although it is unlikely that any of these taxa would be tetraploid, and perhaps be more crossable with American elm, we will endeavor to obtain seed of these taxa in the near future.

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